1   **SYSTEM AND METHOD FOR NETWORK CONFIGURATION**

2   **ENGINE**

3

4   **Field of the Invention**

5   The   invention   relates   to   the   field   of
6   communications,   and   more   particularly   to   an
7   extensible   network   configuration   engine   for   the
8   selection and deployment of network elements using a
9   universal tool.

10   **Background of the Invention**

11   The   communication   industry,   including
12   telephonic, IP-based digital and other networks, has
13   seen the type and number of network elements multiply
14   in recent years.   Unfortunately, manufacturers of
15   network equipment such as routers, switches, database
16   elements and others have not made it a priority to
17   create flexible configuration tools.

18   Thus,   a   manufacturer   of   data,   telephone   or
19   hybrid   telephone/data   switches   might   provide   an
20   independent software package to select and configure
21   networks   composed   of   its   own   products.   However,
22   networks   built   from   components   made   by   diverse
23   manufacturers   have   had   no   universal   tool   for   the
24   selection, testing and integration of overall network
25   architectures.   The costs of network acquisition and
26   maintenance,   as   well   as   personnel   training,   are
27   therefore increased. Other problems exist.

28

1   ## Summary of the Invention

2   The invention overcoming these and other

3   problems in the art relates in one regard to a system

4   and method for a network configuration engine, the

5   configuration engine having an extensible library of

6   network elements to selectively add, drop or change

7   the network devices and services being prepared and

8   deployed.   In   one   embodiment,   the   network

9   configuration   engine   of   the   invention   may   be

10 implemented   as   a   portable   software   package,   for

11 instance a Java module, which serves to abstract the

12 hardware and software specifications and interfaces

13 from   one   or   many   manufacturers   while   permitting

14 simulation and configuration of assembled networks to

15 take place.   Both physical network elements as well

16 as user interfaces, such as network mappers and other

17 software tools, may be configured according to the

18

19   ## Brief Description of the Drawings

20   The invention will be described with reference

21 to the accompanying drawings, in which like elements

22 are referenced with like numerals.

23   Figure   1   illustrates   a   network   configuration

24 engine according to an embodiment of the invention.

25   Figure 2 illustrates a network element library

26 for use in a network configuration engine according

27 to an embodiment of the invention.

28   Figure   3   illustrates   a   user   interface   for

29 manipulating   testing   and   other   functions   of   the

1 network configuration engine according to an
2 embodiment of the invention.
3   Figure 4 illustrates a flowchart of
4 configuration processing according to an embodiment
5 of the invention.
6

7   **Detailed Description of Preferred Embodiments**

8   An overall architecture for a network
9 configuration engine 102 according to the invention
10 is illustrated in Figure 1. According to this
11 embodiment, the network configuration engine 102 may
12 include a client 104 communicating with a network
13 element database 106 and a network port 108. The
14 client 104 may access the network element database
15 106 to determine the specifications, interfaces,
16 versions, update status and other attributes of one
17 or more network element 110 which may be used to
18 build network hardware, features or services using
19 one extensible tool.

20   In one embodiment, the client 104 may be,
21 include or interface to, for instance, a personal
22 computer running the Microsoft Windows^{TM} 95, 98,
23 Millenium^{TM}, NT^{TM}, 2000 or XP^{TM}, Windows^{TM}CE^{TM},
24 MacOS^{TM}, PalmOS^{TM}, Unix, Linux, Solaris ^{TM}, OS/2 ^{TM},
25 BeOS ^{TM}, MacOS ^{TM}, VAX VMS or other operating
26 system or platform. Client 104 may furthermore
27 include electronic memory such as RAM (random
28 access memory) or EPROM (electronically
29 programmable read only memory), storage such as a

1   hard drive, CDROM or rewritable CDROM or other
2   magnetic, optical or other media, and other
3   associated components connected over an
4   electronic bus, as will be appreciated by persons
5   skilled in the art.

6   The client 104 may be equipped with an
7   integral or connectable cathode ray tube (CRT),
8   liquid crystal display (LCD), electroluminescent
9   display, light emitting diode (LED) or other
10 display screen, panel or device for viewing and
11 manipulating files, data and other resources, for
12 instance using a user interface 112, such as a
13 graphical user interface (GUI) or command line
14 interface (CLI). Client 104 may also be, include
15 or interface to a network-enabled appliance such
16 as a portable networkable notebook or similar
17 computer, a wireless cellular or other wireless
18 device, an intelligent instrumentation platform
19 or other host system.

20   The client 104 may communicate with the network
21 element database 106 to assess, configure, test,
22 modify and otherwise manipulate the setup and design
23 of one or more networks, for instance telephone,
24 Internet Protocol, Local Area Networks (LANs) or
25 other network or network elements using one or more
26 network element 110. As illustrated in Figure 2, the
27 network element database 106 may include a network

1   element library 114 which contains sets of data on
2   one or more network element 110.
3   Each of the one or more of network element 110
4   may be, include, or interface to, for instance, a
5   data router, a data switch, a data hub, a telephone
6   platform such as a central office switch or a mobile
7   switch, a gateway platform, a modem bank, a T1 or T3
8   line, an optical switch or multiplexer such as a
9   wavelength division multiplexer (WDM) or other
10 optical component, a database or database cluster, a
11 redundant database such as a RAID installation, or
12 other wired or wireless, optical, mechanical or
13 electrical component.
14   The network element database 106 housing the
15 network element library 114 may be, include or
16 interface to may be, include or interface to, for
17 example, the Oracle™ relational database sold
18 commercially by Oracle Corp. Other databases,
19 such as Informix™, DB2 (Database 2), Sybase™ or
20 other data storage or query formats, platforms or
21 resources such as OLAP (On Line Analytical
22 Processing), SQL (Standard Query Language), a
23 storage area network (SAN), Microsoft Access™ or
24 others may also be used, incorporated or accessed
25 in the network element database 106 of the
26 invention.
27   The network element database 106 may adhere
28 to hierarchical, relational, flat or other
29 models. The network element database 106 may be
30 supported by server or other resources, and may

1 in embodiments include redundancy, such as a
2 redundant array of independent disks (RAID), for
3 data protection.

4   The network element database 106 and network
5 element library 114 may store information regarding
6 an extensible set of network protocols and types for
7 installable components, for instance including the
8 dynamic host configuration protocol (DHCP), routing
9 information protocol (RIP), the transmission control
10 protocol (TCP), the Internet protocol (IP), the
11 domain name service (DNS), the simple network
12 management protocol (SNMP), the media gateway control
13 protocol (MGCP, or H.248), the gateway location
14 protocol (GLP), the simple Internet protocol plus
15 (SIPP), resource allocation protocol (RAP), the
16 service location protocol (SLP), the lighteight
17 directory access protocol (LDAP), and other
18 protocols, data formats and other configuration types
19 which may be employed in the design, programming,
20 testing and maintenance of networks.

21   Because the hardware and software interfaces and
22 other requirements for the one or more network
23 element 110 are abstracted in the network element
24 library 110, by using the network configuration
25 platform 102 of the invention a network administrator
26 may configure and assess a variety of network
27 implementations without having to stop and execute a
28 different proprietary tool for each component.

29   In embodiments, the network administrator or
30 other user may communicate with a physical or virtual
31 network being configured using the network port 108,

1   for hot testing and other purposes. In other
2   embodiments, the client 104 may image the subject
3   network so that network configurations may be loaded
4   to tape, disk or otherwise stored for later delivery,
5   testing, validation or modification.
6   As illustrated in Figure 3, using the user
7   interface 112 of client 104, a network administrator
8   or other user may configure, initiate, program,
9   modify, test and otherwise manipulate a physical or
10 virtual representation of a subject network. The
11 user interface 112 may present a user with a text or
12 graphical representation of the elements of a network
13 and their associated characteristics. In an
14 embodiment as illustrated, the user interface may
15 present the user with a network map showing network
16 elements, their connection topology and other
17 characteristics. In embodiments, the configured
18 network may be simulated to examine fault conditions,
19 throughput or other network conditions. In other
20 embodiments, if the client 104 may communicate via
21 network port 108 with physical implementations,
22 testing of the hardware components may be performed.
23 In embodiments, the user interface 112 may permit the
24 user to capture an image of a subject network for
25 further modification or testing, for instance by
26 storing the network nodes, protocols, interface
27 specifications and other data to electronic or disk
28 memory.
29   In embodiments, the user interface 112 may be
30 programmed with or include or interface to network
31 enabled code. The network enabled code may be,

1   include or interface to, for example, Internet
2   Protocol (IP) or Internet Protocol Next
3   Generation (IPng) code or data, Hyper text Markup
4   Language (HTML), Dynamic HTML, Extensible Markup
5   Language (XML), Extensible Stylesheet Language
6   (XSL), Document Style Semantics and Specification
7   Language (DSSSL), Cascading Style Sheets (CSS),
8   Synchronized Multimedia Integration Language
9   (SMIL), Wireless Markup Language (WML), Java^{TM},
10 Java^{TM} Beans, Enterprise Java^{TM} Beans, Jini^{TM}, C,
11 C++, Perl, UNIX Shell, Visual Basic or Visual
12 Basic Script, Virtual Reality Markup Language
13 (VRML), ColdFusion^{TM}, Common Gateway Interface
14 (CGI), the Simple Internet Protocol Plus (SIPP),
15 servelets, peer-to-peer networking code or other
16 compilers, assemblers, interpreters or other
17 computer languages or platforms.
18   Overall configuration processing according to
19 the invention is illustrated in Figure 4. In step
20 402, processing begins. In step 404, a user may
21 access the user interface 112 of the client 104 to
22 set up, configure, test, maintain, program or
23 otherwise manipulate one or more networks, such as a
24 wired, wireless or optical telephone or data network.
25   In step 406, the user interface 112 may be used
26 to access and manipulate the network element database
27 106. In step 408, data regarding one or more network
28 element 110 may be accessed to configure the subject
29 network, such as by inserting one or more network
30 element 110 into a test or operating network. In

1   step 410, the client 104 may communicate with a test,

2   virtual or operating network via network port 108,

3   for testing or other purposes if desired.

4   In step 412, the client 104 may collect data

5   from a test, virtual or operating network as

6   appropriate, for instance for maintenance, upgrade or

7   other purposes. In step 414, the network element

8   library 114 may be modified, for instance to add,

9   delete, update or otherwise modify a list of the one

10   or more network element 110 or otherwise. In step

11   416, an image of the subject network, including

12   configuration, operating condition, active or

13   inactive status and other states may be stored as

14   appropriate. In step 418, processing ends.

15   The foregoing description of the system and

16   method of the invention is illustrative, and

17   variations in configuration and implementation will

18   occur to persons skilled in the art.

19   For instance, while the invention has been

20   generally described with respect to a configuration

21   where a single client 104 operates to control the

22   configuration of a network, two or more client

23   devices may cooperate to control the setting of the

24   subject network. Likewise, while the invention has

25   generally been described in terms of configuring a

26   single network, in embodiments multiple networks,

27   including networks of networks, may be configured and

28   manipulated according to the invention.

29   The scope of the invention is accordingly

30   intended to be limited only by the following claims.